## 2.7 NAS Aviation Research Plan Program Management

### Mission

This program provides for effective and responsible stewardship of the funds entrusted to the FAA for research and development by NAS users. The FAA seeks maximum benefit for dollars invested in programs whose outputs and outcomes are important to users.

### Intended Outcomes

This area supports FAA strategic goals and objectives in industry vitality, global leadership, business practices, and communications. Specifically, work is aimed at:

- Increasing customer and stakeholder knowledge of the NAS Aviation Research Plan (NARP) program
- Increasing customer and stakeholder participation in formulating the NARP program
- Improving resource management through more efficient and effective processes for developing and managing the NARP investment portfolio
- Developing and implementing—through U.S. leadership, international cooperation, and harmonization—communication, navigation, and surveillance/air traffic management (CNS/ATM) and other technologies that improve safety and efficiency
- Developing partnerships that provide access to the best academic and industrial research and development talent
- Focusing industrial research and development toward future aviation technology needs

### Program Area Outputs

- Annual NARP
- NARP Advisory Committee reports
- NARP budget
- International planning and plans designed to provide worldwide aviation harmonization and interoperability
- Bilateral/multilateral agreements with foreign civil aviation authorities that create cooperative research programs for aviation systems development
- Cooperative research agreements with colleges, universities, other government agencies, and industry.

### Program Area Structure

The program areas are:

1. NARP strategic management
2. NARP portfolio analysis
3. NARP financial management
4. NARP Advisory Committee
5. Cooperative international research and development programs
6. National Aeronautics and Space Administration (NASA) field offices
7. Research and development partnerships

Effective stewardship of the NARP program ensures NAS users receive the best program for the money.

The first four NARP program management areas strive to ensure that the FAA:

- Does the right work for the customer
- Represents that work in the form of the budget and the NARP
- Provides responsible financial program management once funding has been received

The work in areas five and six ensures that research funding does not duplicate ongoing research elsewhere, particularly at NASA. The FAA must also ensure that planned research and development (R&D) is complementary to research that is being performed elsewhere, both domestically and internationally, and that the FAA is knowledgeable of and informed about research performed elsewhere. Elements five and six are directed towards this end.

The last area is directed toward ensuring that the FAA leverages limited resources through cooperative research programs with industry, academia, and other government agencies. These R&D partnerships provide the FAA with a single source of expertise on cooperative research programs and a service area that allows individual projects to quickly and efficiently enter into cooperative research programs with others while minimizing bureaucratic red tape.

The first six elements are described in the NARP management RPD and the last element is described in the NARP partnerships RPD.

**Customer/Stakeholder Involvement**

The FAA, through the mechanism of its NARP Advisory Committee, solicits guidance on its research and development programs. This committee is composed of members from organizations that are customers or stakeholders of FAA products and services. Committee representation includes associations, users, corporations, other government agencies, universities, and research laboratories.

**Accomplishments**

*NARP management*

- The 1998 FAA Plan for Research, Engineering and Development (R,E&D), February 1998
- The FY 1999 Budget, January 1998
- R,E&D Advisory Committee reports on:
  - Recommendations on FAA's Planned R,E&D Investments for FY 1998, June 1996
  - Report of the Challenge 2000 Subcommittee, March 1996
  - Subcommittee Report of the NAS ATM R&D Panel, March 1997
  - Recommendations on FAA's Planned R,E&D Investments for FY 1999, April 1997
  - Report of the Subcommittee on Air Traffic Services, January 1998
  - Report of the Subcommittee on Runway Incursions, January 1998
- R,E&D Advisory Committee guidance for the FY 2000 Investment Portfolio, September 1997
- R,E&D Advisory Committee subcommittees review of the proposed FY 2000 Target Area Team portfolios, February–March 1998
- FY 1999–2003 R,E&D Programing and Budgeting Process Guidance, November 1996
- FY 1999–2003 R,E&D Programming and Budgeting Process Cost, Benefit, and Risk Guidelines (update), November 1997
- Aircraft Safety Program Benefits Analysis–Briefing Package, January 1998
- International Civil Aviation Organization (ICAO) Air Navigation Commission acceptance of U.S.-proposed changes to the Standards and Recommended Practices (SARP) structure and the chartering of two working groups to review U.S.-proposed changes to SARP development practices. These work groups are:
  - Digital Voice Telecommunications Network (QSIG) Working Group
  - RTCA SC-159/EUROCAE WG-54 Air Traffic Services (ATS) Safety and Interoperability Working Group
- Implemented the Asia Pacific Air Navigation Planning and Implementation Regional Goup's (APANPIRG) organization structure and mode of operation, based on U.S. suggestions and recommendations
- Initiated a Memorandum of Cooperation with the Republic of Singapore for placement of a satellite ground reference station in Singapore that will gather data on the effects of solar activity on global positioning satellite signals as they pass through the atmosphere
- Initiated an agreement with New Zealand allowing the United States to gather data on global positioning satellite health as the satellites pass through the Southern Hemisphere en route to the Northern Hemisphere
- Developed a new APANPIRG policy mandating the use of the Airborne Collision Avoidance System within the region
- Formed a new Satellite Navigation and Communications Advisory Committee, led by AAR-300, under the auspices of the Asia Pacific Economic Cooperation (APEC) Transport Ministers
- R,E&D Portfolio Development Process Reengineering—Update, October 1997

*Research and Development Partnerships*

- Industry Research Program Group Technology Transfer:
  - Negotiation/award of cooperative research and development agreements
  - Negotiation of patent licenses

– Technical assistance to state and local governments, and other Federal agencies

– Technical assistance to private industry to develop commercial products for the aviation market

– Market the FAA capabilities and needs at technology conferences and expositions in order to forge new partnerships

– Cooperative research and development agreement (CRDA)/partnership agreement with Boeing, establishing a National Airport Pavement Test Machine at FAA's William J. Hughes Technical Center (WJHTC), leading to a test program for pavement design procedures compatible with current and future large and small aircraft

– CRDA with the Air Force Wright laboratory, the premier laboratory for aeronautics research, for joint research in advanced flight control systems and improved reliability for aircraft engines, October 1996

– CRDA with U.S Air Force Rome Laboratory, the Air Force's premier laboratory for C3I, for joint research in advanced air-to-ground communications and communication architecture research, August 1996

– Multiple CRDA's/partnerships with private industry to develop a process for using RF tagging and positive passenger-baggage matching (PPBM) technology as a means to reduce the possibility of baggage being transported on commercial aircraft without an associated passenger

– CRDA with Delta Airlines and Lockheed Martin Corporation to investigate an epoxy-bonded composite doubler as an improved type of fuselage patch, leading to certification as a door corner reinforcement on L-1011's; testing and evaluation conducted at the FAA non-developmental Item (NDI) Development and Demonstration Center, in Albuquerque, N.M.

- Dual Use Applications Program:

  – Helicopter health and usage monitoring system (The U.S. Navy's Helicopter Integrated Mechanical Diagnostic (IMD) project is designed to integrate and test commercial/military dual use mechanical diagnostic systems in the H-53 and H-60 helicopters. The FAA will demonstrate commercial certification of the IMD system on an FAA S-76 at WJHTC. Flight tests of IMD for maintenance credits will be demonstrated in FY 2001.)

  – Global Positioning System (GPS)-based terrain avoidance and position integrity system (The system is designed to help prevent Controlled Flight into Terrain (CFIT) and improve pilot situational awareness. This program is funded as a Defense Advanced Research Projects Agency (DARPA) Small Business Innovative Research (SBIR), Army STTR Phase II, and Navy Phase III SBIR. Two demonstration flights of this technology occurred on November 10, 2998 at WJHTC.)

*University Research Program Group*

- Aviation Research Grants:

  – Awarded a cooperative agreement to the Experimental Aircraft Association Foundation for joint research in satellite-based communications, navigation, surveillance, and air traffic control/management systems for the general aviation environment (FY 1997)

  – Awarded a cooperative agreement to L-3 Communications, to design, fabricate, and test a next generation high speed computed tomography system for explosives detection (FY 1997)

  – Negotiated a savings to the Government of $10 million, via cost sharing, in awarded grants and cooperative agreements (FY 1997)

- Centers of Excellence:

  – Established a Center of Excellence in Airworthiness Assurance (COE-AWA) under the leadership of Iowa State and Ohio State Universities (FY 1997)

- Joint University Program:

  – 15 RTCA Jackson Awards for excellence in aviation electronics

  – First FAA Excellence in Aviation Award, two American Institute of Aeronautics and Astronautics (AIAA) major field Awards

(Aviation Meteorology), and one Institute of Electrical and Electronics Engineers (IEEE) major field award (Control Systems)

- University Fellowship Program:
  - Received approval of the FAA Executive Steering Committee for Training and Development to allow FAA Employees to become FAA Fellows

*R&D Partnerships*

- Federal Quality Consulting Group for process reengineering
- NARP Advisory Committee for guidance on the R,E&D Program
- 125 research and development agreements from 19 countries and 1 air traffic organization, which represents 17 member states
- EUROCONTROL for cooperative air traffic management research and development programs

**Long-Range View**

Since the work is centered on strategic management of the FAA research and development program, the function will continue as long as the FAA performs research and development. Expected resource requirements in the out years will remain at about 3 to 5 percent of the aviation research budget.

## A01a System Planning and Resource Management

### GOALS:

**Intended Outcomes:** The FAA intends its R,E&D programs to meet customer needs, increase program efficiency, and reduce management and operating costs more effectively. The FAA further intends to ensure greater proliferation of U.S. standards and technology to meet worldwide aviation needs, thereby increasing customer and stakeholder involvement in its programs.

**Agency Outputs:** The FAA prepares the annual R,E&D budget submission to Congress and publishes the *National Aviation Research Plan* (NARP), formerly titled the *FAA Plan for Research, Engineering and Development*. The agency hosts three R,E&D Advisory Committee (REDAC) meetings annually, as well as a number of subcommittee meetings. REDAC produces reports that provide advice and recommendations to the FAA on the R,E&D program.

**Customer/Stakeholder Involvement:** REDAC reviews the FAA's research commitments annually and provides guidance for future R,E&D investments. The advisory committee is limited to 30 members. They represent customer and stakeholder groups as well as subject-matter experts from various associations, user groups, corporations, government agencies, and universities and research centers.

The Radio Technical Commission for Aeronautics (RTCA) offers the aviation community consensus-based recommendations on the NAS Architecture and related issues. It seeks to find solutions to problems involving communications, navigation, and surveillance systems and air traffic management, (e.g., GPS) implementation, data link, automatic dependent surveillance-broadcast (ADS-B), and decision support systems). The RTCA recommendations are important to FAA policy and investment decisions; they serve as a basis for certification and are referenced in FAA technical standard orders.

**Accomplishments:** The agency has consistently provided annual R,E&D program status information through the *Plan for R,E&D.* It has prepared and submitted the R,E&D budget requests to OMB and to Congress. REDAC has provided the FAA with an independent strategic view on the agency's research commitments. Recent committee reports have reviewed the Aircraft Safety Research program (February 1996), the Human Factors program (August 1996), the Aviation Security program (September 1996), the Air Traffic Services program area (March 1997), Flight 2000 (June and November 1997), the Runway Incursion Reduction program (January 1998), and the FAA's planned FY 2000 R,E&D investments (April 1998).

RTCA has provided the FAA with the aviation community consensus needed to implement free flight and modernize the NAS. The RTCA Government/Industry Free Flight Steering Committee, through the efforts of its Select Committee, has provided recommendations to the Administrator to advance progress of the Free Flight Task Force Report and Action Plan. It has also provided operational concept and program plan input to the Flight 2000 initiative.

**R&D Partnerships:** The FAA's R&D partnerships are described in each budget line item.

### MAJOR ACTIVITIES AND ANTICIPATED FY 1999 ACCOMPLISHMENTS:

*R,E&D plans and programs*

- Published the *FAA Plan for Research, Engineering and Development*
- Prepared the annual budget submission

*R,E&D Advisory Committee*

- Provided review of and recommendations for FY 2001 R,E&D Program
- Provided guidance for FY 2002 R,E&D Program

*RTCA Free Flight Steering Committee*

- Develop/sustain aviation community consensus on NAS Modernization (i.e., the Government/Industry Operational Concept and the NAS Architecture
- Facilitate implementation of Free Flight Phase 1 (FFP1) initiatives
- Provide recommendations on use of augmented GPS for navigation

- Develop community consensus and facility implementation of restructured Flight 2000 program

*Task Force 4*

- Submit certification task force report
- Provide recommendations to increase safety
- Reduce time and cost of implementing new operational capabilities
- Work with FAA on implementing agreed-upon recommendations

*Special Committees*

- Complete minimum aviation system performance standards (MASPS) for GPS Category I/II/III
- Complete report for airport surface surveillance navigation using GPS
- Complete MASPS/MOPS for ADS-B
- Complete MOPS for VHF Digital Radio, Mode 2
- Provide review and comment to FAA ATS on Initial and Final Requirements Documents

**KEY FY 2000 PRODUCTS AND MILESTONES:**

*R,E&D plans and programs*

- Publish the NARP
- Prepare the annual budget submissions.

*R,E&D advisory committee*

- Prepare Air Traffic Services Report
- Prepare Airport Technology Report
- Prepare Environment and Energy Report
- Prepare recommendations on planned R,E&D investments for FY 2002
- Prepare other reports as requested by the Administrator

*RTCA Free Flight Steering Committee*

- Develop/sustain aviation community consensus on NAS Modernization—Government/Industry Operational Concept and NAS Architecture
- Continue to facilitate implementation of Free Flight Phase 1 initiatives
- Continue to help implement restructured Flight 2000 program (now Safe Flight 21) that integrates CNS and ATM operational capabilities

*Task Force 4*

- Continue to develop and maintain aviation community consensus and assist with implementation of Certification Task Force recommendations

*Special Committees*

- Update Environmental Testing Guidelines (Airborne Equipment)
- Update GPS, Wide Area Augmentation System (WAAS), and Local Area Augmentation System (LAAS) documents
- Prepare documents for ATS Safety and Interoperability Requirements
- Complete MOPS for VHF Digital Radio, Mode 3
- Complete Industry Requirements for Terrain and Obstacle Information for Aeronautical Use
- Complete Industry Requirements for Airport Mapping Information
- Continue to review and comment to FAA ATS on Initial and Final Requirements

**FY 2000 PROGRAM REQUEST:**

The FAA's R,E&D program strategic management encompasses four steps to plan the program and four steps to execute the plan. These steps are distinctly different from project-level tactical planning and execution, neither replacing nor duplicating those efforts. The steps provide a structured program portfolio that unifies customer needs with limited available resources.

Step one, the planning phase, identifies specific FAA outputs to achieve desired outcomes. This step must include customer and REDAC participation to accurately identify the research needed to meet product and service requirements.

Step two groups product and service requirements into six major service areas. Teams assigned to each area study the requirements and devise an overall, integrated approach to satisfy them. The service areas provide a mechanism that groups similar requirements so that those related to a spe-

cific area, such as air traffic services, are considered together.

Step three develops a set of research projects to support the strategy and provides the necessary R&D products for the needed outputs once the service area establishes the integrated strategy in step two. To achieve desired outcomes, this step requires the R,E&D Advisory Committee to provide input on the quality and potential of proposed research projects.

The fourth and final step establishes a cross-functional management team to review the work of the individual service area teams and to balance the work across the areas. This ensures that the most important work is accomplished with the available resources. The REDAC conducts a review of the proposed program and provides recommendations to FAA decisionmakers. This step should produce the R,E&D investment portfolio, which is the basis for the FAA's R,E&D budget submission to Congress.

The execution phase provides core, essential services across all the service areas, including:

- Financial management of the R,E&D program
- Financial support for REDAC, a body of customers and aviation experts drawn from outside the FAA, who provide guidance to the Administrator on R,E&D program planning and execution
- Negotiation and execution of bilateral and multilateral agreements with international civil aviation authorities. These agreements establish cooperative R,E&D programs, system standards, and air traffic system procedures

| A01a - System Planning and Resource Management Product and Activities | Program Schedule | | | | | |
|---|---|---|---|---|---|---|
| | FY 1999 | FY 2000 | FY 2001 | FY 2002 | FY 2003 | FY2004 |
| ***011-130 R,E&D Plans and Programs*** | | | | | | |
| **R,E&D Plans and Programs** | | | | | | |
| **Publish Annual *Plan for R&D*** | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| **Prepare Annual Budget Submissions** | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| **R,E&D Advisory Committee Reports** | | | | | | |
| **Recommendations on FAA, RE&D Investments** | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| **Standing Subcommittee on Air Traffic Services** | ◆ | | ◇ | | ◇ | |
| **Standing Subcommittee on Airport Technology** | ◆ | | ◇ | | ◇ | |
| **Standing Subcommittee on Aircraft Safety** | | ◇ | | ◇ | | ◇ |
| **Standing Subcommittee on Aviation Security** | | ◇ | | ◇ | | ◇ |
| **Standing Subcommittee on Human Factors** | | ◇ | | ◇ | | ◇ |
| **Standing Subcommittee on Environment and Energy** | ◆ | | ◇ | | ◇ | |
| **RTCA** | | | | | | |
| **Develop MOPS/MASPS and/or Changes to Existing Recommended Standards for GPS WAAS and LAAS CAT I/II/III** | ◆ | | ◇ | ◇ | | |
| **Completed MOPS for High Frequency Data Link** | ◆ | | | | | |
| **Develop MOPS/MASPS and/or Changes to Existing Recommended Standards for Decision Support Systems** | ◆ | | ◇ | | ◇ | |
| **Develop MOPS/MASPS and/or Changes to Existing Recommended Standards for New VHF Radio** | ◆ | ◇ | | | | |
| **Develop MOPS/MASPS and/or Changes to Existing Recommended Standards for ADS-B** | ◆ | | ◇ | | | |
| **Update of Free Flight Action Plan Progress** | ◆ | ◇ | ◇ | ◇ | ◇ | |
| **Input to Safe Flight 21 Program Activities** | ◆ | ◇ | | | | |

| Budget Authority ($ in Thousands) | FY 1996 Enacted | FY 1997 Enacted | FY 1998 Enacted | FY 1999 Enacted | FY 2000 Request |
|---|---|---|---|---|---|
| Contracts | 0 | 200 | 1,164 | 385 | 1,294 |
| Personnel Costs | 1,660 | 1,378 | 0 | 685 | 0 |
| Other Costs | 340 | 282 | 0 | 94 | 0 |
| **Total** | **2,000** | **1,860** | **1,164** | **1,164** | **1,294** |

### A01b William J. Hughes Technical Center Laboratory Facility

**GOALS:**

**Intended Outcomes:** The FAA test beds located at the WJHTC support R,E&D program goals to:

- Reduce the number of accidents and accident risk.
- Perform airspace studies and improve airspace design.
- Increase airport capacity.
- Reduce delays due to weather and system outages.
- Reduce unnecessary flight restrictions.
- Reduce user costs

The WJHTC maintains and operates agency test bed laboratories that R,E&D programs use to achieve the above goals. These centralized testbeds consist of non-operational NAS systems, aircraft, simulation facilities, communication systems, and a Human Factors Laboratory.

**Agency Outputs:** FAA programs develop the technical characteristics for new systems and procedures. R,E&D programs require their test beds to emulate and evaluate various field condition requirements. Human factors projects require laboratories to perform human-in-the-loop simulations, measure human performance, and evaluate human factors issues. Airborne and navigation projects require "flying laboratories" that are specially instrumented and reconfigurable to support different projects. Developmental programs require simulation systems to recreate realistic scenarios.

**Customer/Stakeholder Involvement:** The test beds directly support agency projects and integrated product teams in these areas:

- Capacity and air traffic management technology
- Communications, navigation, and surveillance
- Operation concept validation
- Free flight
- Weather
- Airport technology
- Aircraft safety technology
- System security technology
- Human factors
- Environment and energy
- Traffic alert and collision avoidance system (TCAS)
- GPS
- Terminal instrumentation procedures (TERPs)
- WAAS

**Accomplishments:** The technical laboratory facilities provide the test bed infrastructure to support R,E&D program goals and outputs.

**R&D Partnerships:** In addition to the R,E&D programs listed, WJHTC laboratories cooperate with the Canadian Ministry of Transport, NASA, U.S. Air Force, Aircraft Owners and Pilots Association (AOPA), Experimental Aircraft Association (EAA), ICAO, and academia.

**MAJOR ACTIVITIES AND ANTICIPATED FY 1999 ACCOMPLISHMENTS:**

The laboratories supported the following programs:

- GPS
- WAAS
- TERPS
- Satellite communication
- Data link
- TCAS
- Vertical separation
- Automated Radar Terminal System (ARTS) IIIE
- Host replacement
- Y2K end-to-end testing
- Runway friction
- Aircraft deicing
- Aircraft security
- Traffic Flow Management laboratory

**KEY FY 2000 PRODUCTS AND MILESTONES:**

The WJHTC testbeds provide the necessary infrastructure for R,E&D programs to achieve their

goals. Specific milestones and products are contained within individual programs.

**FY 2000 PROGRAM REQUEST:**

The WJHTC will maintain and operate technical laboratories/facilities that support R,E&D programs.

| A01b - William J. Hughes Technical Center Laboratory Facility Product and Activities | Program Schedule | | | | | |
|---|---|---|---|---|---|---|
| | FY 1999 | FY 2000 | FY 2001 | FY 2002 | FY 2003 | FY2004 |
| *011-140 WJHTC Laboratory Facility* | | | | | | |
| Systems Support Laboratory (En Route, Terminal, Automated Flight Station, Communications, and Scan Radars | | | | | | |
| Aviation System Capacity Planning | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| National Simulation Capability | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Flight 2000 | ◆ | | ◇ | ◇ | ◇ | ◇ |
| Research & Development Laboratory (Target Generator Facility, Cockpit Simulator, Auto Tracking, Tech Center Data) | | | | | | |
| Aviation System Capacity | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| National Simulation Capability | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| GPS and Separation Standards | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Safe Flight 21 | | | ◇ | ◇ | ◇ | ◇ |
| WAAS | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| TERPS | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Data Link | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| TCAS | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| General Support Laboratory (Aircraft) | | | | | | |
| Satellite Communications and Navigation Programs | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| GPS and Separation Standards | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Safe Flight 21 | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| WAAS | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| TERPS | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Data Link | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| TCAS | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Runway Friction | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Aircraft Deicing | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Aircraft Security | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Airport Safety Technology | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Human Factors Laboratory | | | | | | |
| Air Traffic Control Human Factors | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Safe Flight 21 | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Data Link | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |

| Budget Authority ($ in Thousands) | FY 1996 Enacted | FY 1997 Enacted | FY 1998 Enacted | FY 1999 Enacted | FY 2000 Request |
|---|---|---|---|---|---|
| Contracts | 4,202 | 3,435 | 3,341 | 3,268 | 3,300 |
| Personnel Costs | 3,152 | 2,627 | 3,905 | 6.462 | 6,988 |
| Other Costs | 646 | 538 | 800 | 0 | 787 |
| **Total** | **8,000** | **6,600** | **5,440** | **9,730** | **11,075** |

### A01c Center for Advanced Aviation System Development (CAASD)

**GOALS:**

**Intended Outcomes:** CAASD is essential to the FAA's research program because it augments the agency's in-house resources for conducting research for the ATS line of business.

**Agency Outputs:** The CAASD research program provides detailed reports, briefings, and concept demonstration systems used in evaluating new ATM and control operating concepts and/or infrastructure replacements. These products are the critical elements in beginning development of a more efficient, more available, and safer next-generation ATM and control system.

CAASD provides new technology research for applications for global air traffic management, including new developments in traffic flow management, navigation, separation assurance, surveillance technology, and system safety.

**Customer/Stakeholder Involvement:** The FAA's challenge is to increase safety in the Nation's civil aviation system while increasing capacity and efficiency. Outcomes within CAASD's work program span both FAA and system stakeholder issues and needs, including collaborative traffic flow management.

The CAASD R,E&D effort supports the RTCA Free Flight Steering Committee. This committee provides the principal collaborative forum among industry, aircraft operators, and FAA representatives in developing plans and requirements for the NAS to evolve to Free Flight. It defines operational needs leading to free flight and identifies the required affordable NAS Architecture that satisfies those needs.

Additionally, the CAASD R,E&D effort supports the ICAO in its efforts to develop worldwide navigation capabilities: (1) wide area augmentation system; (2) local area augmentation system; and (3) worldwide air-ground communication capability of very high frequency air-ground digital radio. ICAO is the principal venue for international standards development and validation.

**Accomplishments:** CAASD supported the following accomplishments:

- Assisted in defining a longer-term evolution of decision support capabilities to move the ATM system closer to free flight objectives
- Supported surveillance server prototyping, development, and implementation; and refined the architecture, transition plan, and decommissioning strategies based on test results
- Investigated procedures, user needs, system requirements, and architecture implications for enhanced information systems
- Assisted in developing an investment strategy to ensure high-level design decisions based on an integrated evolutionary operational concept
- Continued to provide the FAA with a strategic understanding of technology's role in developing the future ATM system

**R&D Partnerships:** In producing work program outcomes, CAASD has forged extensive partnerships with industry suppliers, aircraft operators, operational FAA facilities, and other nonprofit research institutions. For example, CAASD maintains a cooperative research relationship with ATN Systems, Inc., to refine and validate the technical characteristics of an aeronautical telecommunications network router.

CAASD also maintains a cooperative research relationship with the Florida Institute of Technology (FIT) to develop and validate the technical characteristics of flight information services broadcasts. In a joint project with FIT, CAASD developed an air-ground prototype to disseminate weather information to NAS users in flight.

**MAJOR ACTIVITIES AND ANTICIPATED FY 1999 ACCOMPLISHMENTS:**

- Developed a greater understanding of free flight concepts to potentially alter technology and processes for system operations, thus providing flexibility and more efficient services
- Continued investigating procedures, user needs, system requirements, and architecture implications for enhanced information systems
- Made best use of GPS and advanced avionics technology to reduce operating costs to NAS users

**KEY FY 2000 PRODUCTS AND MILESTONES:**

- CAASD will research new ATM and control operating concepts evaluation and/or infrastructure replacements
- CAASD continues to develop a greater understanding of free flight concepts and operating procedures needed to fully implement associated programs
- CAASD continues to refine the architecture and transition plan, as well as strategies for planned FAA and user investment decision-making tools

**FY 2000 PROGRAM REQUEST:**

Funding is requested to:

- Develop free flight enhancements
- Investigate the expanded use of GPS and advanced navigation systems
- Integrate decision support system requirements with FAA and industry technology applications

| A01c - Center for Advanced Aviation System Development (CAASD) Product and Activities | Program Schedule | | | | | |
|---|---|---|---|---|---|---|
| | FY 1999 | FY 2000 | FY 2001 | FY 2002 | FY 2003 | FY2004 |
| *011-160 Center for Advanced Aviation System Development* | | | | | | |
| Navigation and Surveillance | | | | | | |
| Developed Navigation Architecture for Timely and Cost Effective Transition to Satellite-Based Navigation Systems | ◆ | | | | | |
| Assessed Future Surveillance Alternatives Using Automatic ADS-B Capabilities | ◆ | | | | | |
| Researched Low Cost Avionics Benefiting Free Flight Paradigm | ◆ | | | | | |
| Define Relationships Among Safety, Separation Standards, & Operational Capability to Enhance Safety Management | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Investigate the Expanded Use of GPS and Advanced Navigation Systems | ◆ | ◇ | | | | |
| Traffic Flow Management (TFM) | | | | | | |
| Identified Enhancements to Current TFM System | ◆ | | | | | |
| Developed System Architecture for Implementation of Data Link Infrastructure | ◆ | | | | | |
| Develop/Integrate FAA Decision Support Systems (DSS) with FAA and Industry | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Develop Alternative Methods for Using GPS Technology Inclusion of Free Flight Concepts in Domestic Airspace | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Incorporated GPS Technology into Ongoing Work in Area of Low Cost Avionics to Make Full Use of Traffic Alert and Collision Avoidance System (TCAS) | ◆ | | | | | |
| Continued Investigating Procedures, User Needs, System Requirements, and Architecture Implications for Enhanced Information Systems | ◆ | | | | | |
| Developed a Greater Understanding of Free Flight Concepts to Potentially Alter Technology and Processes for System Operations | ◆ | | | | | |
| Research New Air Traffic Management and Control Operating Concepts Evaluation and/or Infrastructure Replacements | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Develop Free Flight Enhancements | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Integrate DSS Requirements with FAA and Industry Technology Applications | ◆ | ◇ | | | | |

| Budget Authority ($ in Thousands) | FY 1996 Enacted | FY 1997 Enacted | FY 1998 Enacted | FY 1999 Enacted | FY 2000 Request |
|---|---|---|---|---|---|
| Contracts | 0 | 5,200 | 5,444 | 4,890 | 4,900 |
| Personnel Costs | 0 | 0 | 0 | 0 | 0 |
| Other Costs | 0 | 0 | 0 | 0 | 0 |
| **Total** | **0** | **5,200** | **5,440** | **4,890** | **4,900** |

## A10a Strategic Partnerships

**GOALS:**

**Intended Outcomes:** Through initiatives of its Strategic Partnerships program, the FAA intends to channel the results of its R,E&D projects to contribute directly and cost-effectively to maintaining and improving the national air transportation system. To achieve these ends, the program will continue to enter into efficient partnerships with—and take keen interest in improving the quality of results achieved by—other domestic and international government and private research organizations. Program sponsored research will set the highest standards of effectiveness and economy, whether performed in-house or under contracts. The agency also intends to facilitate access to the current aviation research results by all interested parties through maintenance and improvement of its centers of excellence (COE) network.

**Agency Outputs:** Research products of the Strategic Partnerships program generally are produced in conjunction with either industrial or academic institutions.

*Industry Research Program Group*

- Technology transfer
  - – CRDA's provide an inexpensive way for new/innovative FAA R,E&D projects to get started
  - – Government/industry conferences (industry day) bring together the best academic and industry talent for cost-effective R&D partnerships
- Small business innovation research
  - – Small business innovation research (SBIR) addresses Congressional directives for the FAA to maintain support for small business under acquisition reform legislation
- Dual use applications program
  - – FAA/Department of Defense (DOD) technical interchange meetings enable FAA to influence the direction of industry R&D for its own needs

*University Research Programs Group*

- Aviation research grants
  - – Grants and cooperative agreements with colleges, universities, nonprofit institutions, or for-profits in the case of aviation security, leverage the agency's R&D investment
- Centers of Excellence
  - – The FAA leverages matching funds and supports long-term research by establishing research centers covering a broad scope of technical disciplines (operations research, aging aircraft structures, and airport pavement)
- Joint University Program
  - – Quarterly technical review meetings at universities, FAA, and NASA provide customer/stakeholder review and input to FAA's research initiatives
- University fellowship program
  - – FAA Fellows perform research on critical FAA needs, with university cost sharing, reducing FAA's R&D costs

**Customer/Stakeholder Involvement:** Customer/stakeholder feedback is solicited via continuing interface with the FAA REDAC. The committee has recently formed a subcommittee to advise the FAA on cooperative research ventures such as those supported by the R&D Partnership Program.

**Accomplishments:** Program accomplishments are generally achieved in conjunction either with industrial or academic institutions.

*Industry Research Programs Group*

- Technology transfer
  - – CRDA with Boeing Corporation to jointly fund and operate a national airport pavement test machine
- Small business innovation research
  - – Compressed video telecommunications network for air traffic management radar.
  - – Commercial production of a compact neutron source, by Accsys Technology, developed for explosives detection

*University Research Program Group*

- Aviation research grants program

  - – Awarded cooperative agreement to the Helicopter Association International to make available its Maintenance Malfunction Information System to the aviation community
  - – Awarded cooperative agreement for the development of a high speed tomography explosive detection system with Invision Technologies, which will provide a 50-to 100-percent higher throughput and probability of detection
  - – Development of an Undergraduate Research Grants Program responding to Congressional mandate
  - – Collaboration with the Department of Transportation (DOT) in implementing an Electronic Grants application and award system over the Internet
- Joint university program
  - – First recipient of the FAA Excellence in Aviation Award
  - – Fifteen RTCA Jackson Awards for excellence in aviation electronics
  - – Two AIA major field awards (aviation meteorology), one IEEE major field award (control systems)
  - – Memorandum of Agreement with NASA Ames Research Center for jointly funded research in a portfolio of civil aeronautics technologies
- FAA Fellowship Program
  - – Partnership with Drexel University to advise Ph.D. candidates working at the WJHTC on aging aircraft structural modeling

**R&D Partnerships:** The collective vision of this chapter is to provide safe and secure air transportation through partnerships which maximize the FAA R,E&D program investment. In effect, the programs of this chapter function as a clearinghouse for the major share of all partnerships occurring in the FAA R,E&D community.

**MAJOR ACTIVITIES AND ANTICIPATED FY 1999 ACCOMPLISHMENTS:**

*Technology transfer/cooperative activities*

- Issued new CRDA's and reported results of completed projects
- Obtained commercialization of results, products, and processes through CRDA's
- Conducted joint seminars on FAA technology needs/requirements with integrated product teams and other aviation related technical groups
- Presented technology transfer awards
- Provided FAA scientists, engineers, attorneys, and management with intellectual property and CRDA training
- Negotiated licensing agreements
- Evaluated completed CRDA's and compiled report on successful partnerships
- Proactively marketed FAA at technical meetings, conferences, and expositions, for licensing and partnership opportunities
- Developed policy and procedures for donation of excess FAA computers to enterprise zone schools

*Dual use applications program*

- Participated in interagency dual use technology meetings to identify and promote dual use technology opportunities for FAA

*Small business innovation research*

- Solicited SBIR program proposals in response to identified FAA research needs
- Issued annual solicitation for the SBIR
- Awarded phase I SBIR contracts. Phase II and phase III contracts will be awarded leading to industrialization and commercialization of research results obtained under phase I

*Aviation research grants program*

- Issued a national solicitation for research grant proposals
- Began undergraduate research grants program
- Published project reports of aviation research grants program
- Continued to award aviation research grants/ cooperative agreements

*Centers of excellence*

- Established a new COE for airworthiness assurance
- Jointly conducted research at the COE in Operations Research at the University of California (Berkeley), the Massachusetts Institute of Technology, the University of Maryland, and Virginia Polytechnic Institute
- Jointly conducted research at the COE in Airport Pavement Technology at the University of Illinois
- Conducted an annual review for each COE and an audit of COE matching funds at the University of Illinois

*Joint University Program*

- Held quarterly reviews and published annual report
- Transitioned FAA/NASA Joint University Program to FAA/NASA Ames program sponsorship
- Initiated long-term research projects to complement FAA R,E&D

*University fellowship program*

- Selected FAA Fellows, advisors, and awarded fellowships
- Initiated internal FAA Fellows Program
- Held annual technical symposium

**KEY FY 2000 PRODUCTS AND MILESTONES:**

*University Research Programs*

- Aviation research grants
  - – Award grants and cooperative agreements; issue solicitation
  - – Award undergraduate research grants
- Centers of excellence
  - – Start new center; hold annual review—one per center/year; conduct major symposia
- University fellowship program
  - – Award fellowships; hold technical symposia
- Joint University program
  - – Hold quarterly reviews

*Industry Research Programs*

- Technology transfer
  - – Award CRDA's; produce technology assessments; make technology transfer awards; develop patents/licensing
- Dual-use program
  - – Initiate dual-use project proposals of relevance to FAA
- Small business innovation research
  - – FAA-wide research topic survey; national SBIR solicitations; and SBIR contract awards

**FY 2000 PROGRAM REQUEST:**

*Industry and University Research Programs Group*

In FY 2000, the R&D partnerships program brings to fruition those intended outcomes cited above. Dual-use technology, undergraduate research grants, and internal fellowships receive increased emphasis. These will enable FAA research needs to be met with minimal expenditure of R&D contract funds. Concurrently, cost sharing, cost matching, and leveraging of R,E&D funds will be increased under the aviation research grants and centers of excellence programs. Emphasis is on accelerating the search for higher return on investment cooperative research and development agreements. By promoting more widespread use of these R&D partnership vehicles, the FAA increases the speed and efficiency of accomplishing R,E&D projects. This reduces the FAA's funding contribution and improves research results. Critical R,E&D projects and programs receiving reduced funding are able to achieve their R&D goals, while contributing directly to the goals of the FAA Strategic Plan.

| A010a - Strategic Partnerships Product and Activities | Program Schedule | | | | | |
|---|---|---|---|---|---|---|
| | FY 1999 | FY 2000 | FY 2001 | FY 2002 | FY 2003 | FY2004 |
| *101-210 Strategic Partnerships* | | | | | | |
| Industry Research Programs | | | | | | |
| Technology Transfer/Award CRDA's | | | | | | |
| Produce Technology Assessments | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Make Technology Transfer Awards | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Develop Patents/Licensing | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Small Business Innovation Research | | | | | | |
| Perform FAA Wide Research Topic Survey | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Issue National SBIR Solicitation | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Award SBIR Contracts | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| University Research Programs | | | | | | |
| Aviation Research Grants | | | | | | |
| Award Grants and Cooperative Agreements | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Issue Solicitation | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| University Fellowship Program | | | | | | |
| Award Fellowships | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Hold Technical Symposium | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Joint University Program | | | | | | |
| Hold Quarterly Reviews | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Centers of Excellence | | | | | | |
| Establish New Center | | ◇ | | ◇ | | ◇ |
| Hold Annual Reviews | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| Conduct Major Symposium | ◆ | ◇ | ◇ | ◇ | ◇ | ◇ |
| *101-220 NASA Field Offices* | | | | | | |
| Conduct Annual Reviews in Support of R,E&D Efforts Between FAA & NASA for Multiple Programs | | | | | | |
| Provide Continuous Technical Liaison Support Between FAA and NASA Centers Cooperative R,E&D Programs | | | | | | |
| Administer FAA's Portfolio of More Than 60 Memoranda of Agreement with NASA R,E&D Program Offices | | | | | | |

| Budget Authority ($ in Thousands) | FY 1996 Enacted | FY 1997 Enacted | FY 1998 Enacted | FY 1999 Enacted | FY 2000 Request |
|---|---|---|---|---|---|
| Contracts | 0 | 0 | 258 | 0 | 1,421 |
| Personnel Costs | 1,245 | 1,660 | 1,446 | 973 | 0 |
| Other Costs | 255 | 340 | 296 | 27 | 0 |
| **Total** | **1,500** | **2,000** | **2,000** | **1,000** | **1,421** |